DOCUMENT RESUME

ED 284 897 TM 870 444

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TITLE Are Value-Added Analyses Valuable?
PUB DATE 86
NOTE 23p.; In: Assessing the Outcomes of Higher Education; see TM 870 436.
PUB TYPE Speeches/Conference Papers (150) -- Viewpoints (120)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Accountability; Aptitude Treatment Interaction; Colleges; *Educational Assessment; Educational Testing; Evaluation Methods; *Evaluation Problems; Higher Education; Institutional Evaluation; *Outcomes of Education; *Pretests Posttests; *Student Evaluation; Testing Programs; Undergraduate Study; Values
IDENTIFIERS *Value Added

ABSTRACT

The value-added approach to the assessment of student outcomes examines actual or inferred changes in students' performance over time. It also attempts to separate the net effects of instruction from previous ability or simple maturation. Others may have different definitions of this concept, and this vagueness causes problems. Suggested ways to improve value-added assessment include the cross-sectional research design; methods of estimating the effect of a particular collegiate experience independent of students' pre-college differences; multiple regression analysis; analysis of joint or redundant effects not directly attributable to instruction; and the development of causal models. It is also noted that value-added assessments which consider only the general effects of college disregard the possibility that not all students may benefit equally from the same experience. Further attention to this area of research is needed. (GDC)

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Are Value-Added Analyses Valuable?

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TM870 444

Paper presented at the forty-seventh ETS Invitational Conference, sponsored by Educational Testing Service, at The Plaza, New York City, on October 25, 1986.

Are Value-Added Analyses Valuable?

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One of the watchwords of higher education in the late 1970s and on into the 1980s has been "accountability." Public institutions in particular are being called upon to document their effects in terms of student learning and development (Fincher, 1986; Hartle, 1986). Often the impetus for this call to accountability is state government and the higher education coordinating or monitoring boards which, in a number of cases, report directly to the governor or the state legislature. In my own state, Illinois, I have had the opportunity, for the past year, to be a member of a committee chosen by the Illinois Board of Higher Education to study the condition of undergraduate education in the state and make recommendations to the state legislature. Two pertinent paragraphs from the final draft of the report recommendations are as follows:

1. Colleges and universities shall conduct regular reviews of undergraduate education with emphasis on general education and the development of baccalaureate-level skills. The findings and conclusions of these reviews shall be reported to the Illinois Board of Higher Education.

2. Each college and university shall assess individual student progress in meeting the objectives of general education and the development of baccalaureate-level skills, and shall incorporate the results of assessment in the reviews of these areas. It is expected that colleges and universities will assess student progress at appropriate intervals and assure that assessment programs reinforce the maintenance of academic standards.

State-mandated student assessment in Illinois is certainly not an isolated case, as an increasing number of states are moving in a similar direction. Moreover, it is likely, based on the widespread impact of the recent National Institute of Education Report, *Involvement in Learning:*

Realizing the Potential of American Higher Education (Mortimer, et al., 1984), that the current emphasis on estimating the student outcomes of higher education will be with us for the forseeable future.

One of the more recognizable approaches to the assessment of student outcomes is the concept of "value-added." As I understand the term, value-added typically examines actual or inferred changes in students' performance over time. Students are assessed for entering competencies on some set of reliable and valid instruments and then are reassessed following a specified period of time (e.g., freshman to senior year) or the completion of certain courses, programs of study, or other educational experiences (McMillan, 1986). "Value-added" has another implication, however, which goes beyond simply looking at pre-post changes on some measure of interest. Specifically, it attempts to separate that portion of student growth or development which can be reasonably attributed to specific educational experiences from that attributable to confounding causes such as differential ability or simple maturation. In short, value-added entails an estimation of the "net effects" of college.

Of course this is my own understanding of what the term "value-added" implies. It must be acknowledged that its operational definition is likely to vary with who uses the term, in what context and for what purpose (Ewell, 1986). For some institutions, value-added may be inferred from simple freshman to senior changes in measures of cognitive development or learning (e..g., Lenning, Munday and Maxey, 1969; Dumont and Troelstrup, 1981). For other institutions, the value of the education they provide may be evidenced largely by the accomplishments and retrospective evaluations of graduates (e.g., Spaeth and Greeley, 1970; Pace, 1974). Still other institutions may see value added largely as I have defined it, and may concentrate on estimating the net effects of the collegiate experience (e.g., Mentkowski and Strait, 1983). Furthermore, even within the same institution, it can mean different things to different administrative, faculty, student and alumni constituencies. Who decides what is valuable, for whom it is valuable, and to what it is added?

Clearly value-added may not mean the same thing to all who use it. Indeed, as Ewell (1986) has pointed out, the operational definition of the term is still quite flexible and vague, and this vagueness may vary in direct proportion to its increasing use in public dialogue.

I. A Recent Debate on the Value of Value-Added Assessment

Perhaps in part because of the lack of a clear operational definition of the term, the concept of value-added has recently become the focal point of a spirited controversy. Some of the most respected names in the postsecondary scholarly community have chosen sides on the issue. Jonathan Warren (1984) has published an enthusiastic and cogent criticism of value-added. The gist of his argument is that, while in the abstract the logic of value-added has great appeal, in practice it seldom leads anywhere. The results of value-added analyses, he argues, "are often trivial, difficult to make sense of and peripheral to most instructional purposes" (Warren, 1984, p. 10). Warren's argument focuses largely on one level of analysis, the use of the value-added approach in assessing course-level instructional outcomes. Here he makes some telling points about the questionable practice of using pre-post differences as a measure of student learning in courses such as upper-division electromagnetic theory, where students can be assumed to have little pre-course content knowledge. Simply finding that students understand course concepts on the final examination is, he maintains, sufficient evidence to infer that most of the observed learning was a consequence of the course. A similar argument has been made by Pace (1985).

Warren's recommendation is that we need to abandon the unworkable concept of value-added and get on with alternative ways of assessing the effects of postsecondary education. Cameron Fincher (1985) is perhaps less convinced that value-added is a blind alley which needs to be abandoned, yet he is similarly skeptical in elucidating problems in its implementation. These problems, he argues, center on: 1) the development of reliable and valid instruments to measure various educational outcomes; 2) psychometric problems in assessing change; and 3) conceptual problems in interpreting college effects on achievement when most of the variation in achievement may be due to student aptitude, prior achievement and the quality of student learning effort rather than to instructional variables. While not necessarily ready to abandon the concept, Fincher is nonetheless skeptical about the ability of educators to apply value-added concepts to educational issues. He suggests that "if educators could agree on the assessable outcomes of higher education, take the time and effort to develop suitable forms of measurement and assessment, and restructure instructional efforts in terms of explicit instructional objectives, value-added concepts of education might then be

a solution to *some* educational problems" (Fincher, 1985, p. 398, author's emphasis).

Fincher's points are well taken. One must wonder, however, whether the issues which he elucidates are specific problems of a value-added approach to student assessment. A reasonable argument could be made that educational and behavioral research in general have traditionally been confronted with these and similar assessment issues. The knotty problems of instrument validity and attributing student learning to specific instructional practices are longstanding, if not adequately resolved, concerns of those interested in the effects of schooling at all levels (e.g., Wittrock, 1986).

Responding directly to Warren's (1984) article, Astin (1985b) and Ewell (1985) have defended value-added as an important contribution to our thinking about assessing the impact of post-secondary education. Both authors readily admit that the approach is not without its problems. At the same time, however, they argue that it has conceptual strengths which outweigh these problems. These include: 1) a focus on actual student development rather than typical measures of institutional "prestige" or "quality" (e.g., student body selectivity, resources per student, library size); 2) the requirement of clearly defining, in conceptual and operational terms, the desired outcomes of college or other educational experiences; and 3) systematic attempts at assessing the impact of educational experiences. They also argue, quite convincingly, that value-added as an approach to evaluating the impacts of college has been implemented in a systematic manner in only a few postsecondary institutions (e.g., Alverno College, University of Tennessee at Knoxville, Northeast Missouri State University). Thus, abandoning value-added now would be the equivalent of dismissing an idea with considerable rational appeal "before it has been more extensively tried, evaluated and is better understood" (Astin, 1985b, p. 11). Clearly, Astin and Ewell want to avoid throwing the baby out with the bathwater—at least until we have a chance to see how the baby matures.

Astin and Ewell make another point in their defense of value-added. Warren's critique, they suggest, is based almost exclusively on a single level of analysis, i.e., student learning in a single course. Ewell concedes the point that there may be course situations involving a well-defined, specialized body of knowledge to which students were not previously exposed where pretesting makes little or no sense. He further asserts that this is far from a valid critique of the entire value-added concept, however, since value-added is clearly useful in assessing cognitive and developmen-

tal outcomes of curricula and educational experiences more broadly conceived than individual courses. Indeed, it is in assessing these more broad-based effects that value-added has had its most typical application in postsecondary education.

It seems unlikely that the current debate concerning the utility of value-added assessment is over. The term itself is too value-laden and perhaps a bit overly pretentious in its public use by educators. In this sense it may appear to claim more than many current applications of value-added assessment have been able to deliver. As a result it will probably continue to invite spirited criticism which, in turn, adds fuel to an ongoing debate. If this debate is to contribute light as well as heat, however, it may be to our advantage to do two things. First, we might consider redefining value-added as the very fundamental and traditional research question: what are the student developmental outcomes associated with exposure to an educational experience which can be reasonably attributed to the educational experience itself and not to other factors? This is the "net effects" question, and it is far from being a new concern for educational researchers and evaluators (e.g., Campbell and Stanley, 1963; Feldman and Newcomb, 1969; Solmon and Taubman, 1973; Hyman, Wright and Reed, 1975; Bowen, 1977; Astin, 1977, 1982). Indeed, a basic issue in educational research and evaluation has long been the extent to which we can attribute student development to purposeful educational experiences. This is also, I believe, the core of what a value-added approach to student assessment is about.

Given this perspective, a second thing we might do is to place the discourse about value-added on a different level. If we are willing to accept value-added as a potentially important approach to the assessment of student outcomes, then it behooves us to consider ways in which the methodology of the approach might be enhanced and sharpened. The remainder of this paper will suggest and discuss a number of such methodological enhancements.

II. Pre- to Post-Changes: Improvement Can Be Misleading

It is often the case that the value-added or net effects of an educational experience will be inferred from pre- to post-changes (say from freshman to senior year) on some accepted measure of student development (e.g., critical thinking, moral reasoning, reflective judgment, ACT-COMP scores).

Unfortunately, even assuming the reasonable reliability of change scores, such mean changes reflect not only the effects of college, but also the effects of simple maturation. (Other variables such as history, instrument decay, and possibly even regression artifacts if the group is extremely low to begin with could also confound interpretation, but it is likely that maturation over time would be the major confounding variable.) This, of course, means that longitudinal freshman-to-senior changes probably overestimate the effect due to college alone, i.e., the unique effects of college (McMillan, 1986).

One possible way to deal with maturation is through the use of a control group of subjects followed over the same period of time, but not exposed to the particular educational experience (e.g., Plant, 1962; Telford & Plant, 1963; Trent & Medsker, 1968). In the situation where one is assessing institutional effects; however, reasonably comparable control groups not attending college are particularly difficult, if not impossible, to obtain. For such situations there are alternative cross-sectional or combined cross-sectional and longitudinal designs which provide reasonable controls for maturation. Consider the cross-sectional design where freshmen are compared with seniors on a measure of critical-thinking ability. The freshmen, who have not been exposed to the institution, would act as a control group for the seniors, who have theoretically benefited from four years of exposure to it. (To better reflect the entire college experience, the measure of critical thinking might be given to freshmen upon enrollment in the institution and to seniors in the final semester or quarter of their senior year.) The difference between the average freshman and average senior scores, statistically adjusted for differences in age, could be used to estimate the impact of the institution on critical thinking.

There are, of course, potential problems with this design that must be addressed. First, seniors probably represent a more selective group in terms of academic ability since a portion of the least academically proficient are likely to have flunked out or to have left for academic reasons. Second, there is the possibility of differential recruitment or admission criteria being used for the seniors versus the current freshmen (e.g., if the institution used a more stringent set of admissions criteria for the current seniors as versus the current freshmen, the former might be a more academically select group than the latter). This might also lead to systematic group biases on a factor such as academic aptitude, which, in turn, is likely to influence the level of critical thinking. While acknowledging that there is no ideal way to adjust for such pre-existing differences (Lord, 1967), one might nevertheless select the freshmen to be compared

from SAT or ACT ranges similar to those of persisting seniors, and accompany this with regression analysis to provide aptitude- as well as age-adjusted critical-thinking means for the freshman and senior groups. The difference between the aptitude- and age-adjusted means would likely yield a better, though still imperfect, estimate of net institutional effects than that yielded by simply adjusting for age alone.

Cross-sectional designs such as this have recently been employed by a number of researchers in an attempt to separate college effects from those of maturation (e.g., Whitla, 1978; Mentkowski and Strait, 1983). It would also seem reasonable that such cross-sectional designs could be used in conjunction with pre-post longitudinal designs to provide a clearer picture of the influence of college versus the influence of maturation. Because the simple longitudinal results also include the possibility of maturational influences, they might be thought of as the upper-bounds or liberal estimate of the effect of college. Conversely, the adjusted cross-sectional results would tend to statistically remove any joint impacts of the college experience and normal student maturation; thus providing a conservative or lower-bounds estimate of the effect of college. The difference between the longitudinal and adjusted cross-sectional results might be used as an estimate of normal maturation during college. (In the absence of longitudinal data one might use the unadjusted differences between cross-sectional freshmen and senior cohorts to represent the upper-bounds estimate of college effects, the age and aptitude adjusted differences to represent the lower-bounds estimate, and the difference between the unadjusted and adjusted results to represent normal maturation.)

Another cross-sectional design which has been used to disaggregate college effects from age or maturation effects is one which takes advantage of the increasing numbers of older, nontraditional-age students in American postsecondary institutions. In this design, traditional-age freshmen (e.g., age 18), nontraditional-age freshmen (e.g., age 22), traditional-age seniors (e.g., age 22), and nontraditional-age seniors (e.g., age 26), might all be administered the measure of critical thinking. The effects of college versus maturation would be estimated by comparing the freshman to senior differences for both traditional and nontraditional students, with age differences between traditional and nontraditional-age freshmen and between traditional and nontraditional-age seniors. Examples of this design have been used in estimating the effects of formal education on the development of reflective judgment (Perry, 1970) by Strange (1978).

I offer these alternative designs not because they are without flaws,

Indeed, there are internal validity issues (i.e., what is the real cause of the effects observed) associated with both of them. As alternatives to simple pre- and post-assessments, however, they do provide somewhat greater control over the confounding influence of student maturation during college. Consequently, they probably provide more internally valid estimates of the value-added or net effects of educational experiences than do simple pre- to post-changes. In terms of contributing to our understanding of the value-added or net effects of educational experiences, pre- to post-changes in the absence of a control group are quite limited. One might conceive of them as a necessary but insufficient condition for documenting educational impacts. In most instances, the presence of a net educational impact will be accompanied by positive pre- to post-changes on measures of interest. One must be a bit cautious in this regard, however. Recent evidence reported by Wolfle (1983), for example, has suggested that the general effect of college attendance on mathematics achievement is to maintain precollege levels of competence. Net of other factors, those not attending college tend to decline in mathematic competence. Thus a college or educational impact may not always be accompanied by pre- to post-improvement, or even by pre- to post-change.

It is precisely in this type of situation that the term value-added can be misleading or even dysfunctional. As an estimate of college impact, value-added implies that something is added to the individual's level of development. In some areas of development, however, the impact of college (or other educational experiences) may be to prevent or retard decline rather than to induce major positive changes. Consequently approaches to value-added assessment which focus only on pre- to post-changes may be overlooking important college effects.

III. Direct and Indirect Impacts

I would argue that value-added assessment is made increasingly effective and useful in terms of its policy implications as it becomes more specific and focused. At the individual college level, this suggests the importance of identifying specific institutional experiences which enhance student development. Assessments for this purpose are often more fine-grained in conceptualization and analysis than those which are limited to determining the net effects of college or some particular educational experience. At the multi-institutional level, we have some exemplary applications of this

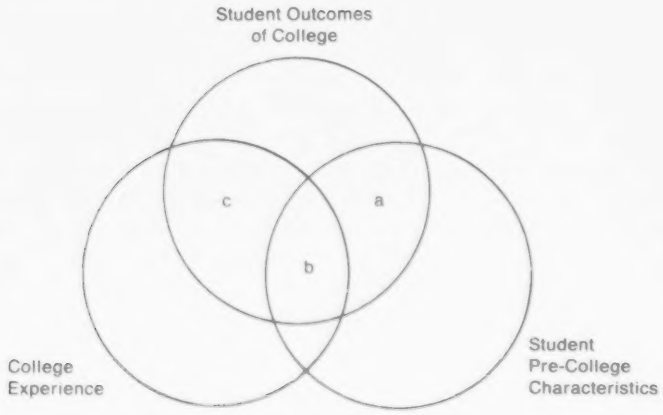
approach in the work of Astin (e.g., Astin, 1968, 1977, 1982; Astin and Panos, 1969) and Pace (1984). Generally this approach involves estimating the associations between various measures of the college experience (e.g., academic major, academic achievement, extracurricular involvement, interaction with faculty) and certain outcomes (e.g., standardized measures of achievement, graduate degree attainment, self-concept, values) with the confounding influence of student pre-college traits (e.g., aptitude, secondary school achievement, social origins) removed statistically. The result is an estimate of the effect of a particular collegiate experience independent of differences in student pre-college traits.

When multiple regression is employed to assess these partial associations between college experiences and college outcomes, the resultant regression coefficients (either standardized or metric) can be interpreted as estimates of the net or direct influence of a particular variable (Wolfle, 1985). Thus, in addition to estimating the extent to which an institution facilitates the development of critical-thinking ability from freshman to senior year, a value-added approach might also attempt to identify those particular institutional experiences that have nontrivial net associations with critical thinking. The results of these and similar analyses can provide useful information in terms of focusing attention on those potentially manipulable collegiate experiences that *may* causally influence the development of critical thinking (e.g., particular courses or course-taking patterns, interaction with faculty). It is important to stress the "may" in the previous sentence, since attributions of causality with correlational data are tenuous at best.

Such analyses are an important extension of value-added assessment and have been the analytic model for many benchmark studies of the influence of college on student development (see Feldman and Newcomb, 1969; Bowen, 1977). At the same time, however, these analyses are limited in their capacity to estimate the full range of a variable's influence. Because student pre-college characteristics and measures of the college experience typically have substantial correlations between and among themselves, there is usually a substantial portion of the explained variance which cannot be uniquely attributed to any particular independent variable. This is typically referred to as the joint or redundant effects of student pre-college traits and the collegiate experience (Cohen & Cohen, 1975). Figure 1 presents a schematic diagram showing the various unique (net) and joint or redundant effects.

Joint or redundant effects have often gone unanalyzed. In a classic paper, however, Alwin and Hauser (1975) suggest that when independent

Figure 1: Schematic of College Effects



a = Unique Effects of Student Pre-College Characteristics

b = Joint Effects of Student Pre-College Characteristics and the College Experience

c = Unique Effects of College (Independent of Student Pre-College Characteristics)

variables are in a causal sequence, unanalyzed joint effects may be attributable to effects transmitted through intervening causes. Recent evidence, for example, has suggested that exposure to preenrollment freshmen orientation may have little direct influence on first-year persistence/withdrawal behavior. However, such orientation experiences may facilitate initial student social integration in college which, in turn, positively influences persistence (Pascarella, Terenzini, & Wolfle, 1986). These are the indirect effects of a variable, and until comparatively recently they have been largely ignored in research on the impact of college on student development. With the increasing acceptance and use of causal modeling as a research and analytical methodology, however, this need not continue. Causal modeling, which is essentially an attempt to fit a theoretical, explanatory model to a matrix of correlations among variables, is the subject of a number of excellent discussions (e.g., Anderson & Evans, 1974; Heise, 1975; Wolfle, 1980; Maruyama & Walberg, 1982; and Wolfle, 1985).

Developing a causal model forces one to think theoretically, and, therefore, specifically and parsimoniously. One must specify not only the important variables (i.e., hypothesized causal influences) to be included in

the model, but also the causal ordering and the pattern of influences (causal paths) among variables. These relationships are then expressed as structural equations. Structural equations, which are typically solved by regression analysis, specify how each variable (including the criterion) is a function of causally antecedent variables in the model.

An important purpose of causal modeling is to portray the system of indirect as well as direct influences in a causal system. Consequently one is able to estimate not only the net direct influence of a variable on some outcome (i.e., the regression coefficient), but also the extent to which that variable influences intervening variables which, in turn, affect the outcome. The latter, of course, are the indirect effects, and are simply the sum of the products of direct effects through variables intervening between the variable in question and the outcome measure.

Because causal modeling permits one to portray the patterns of indirect as well as direct effects on some outcome, it yields a more complete estimation of the total effect (direct + indirect) of any particular variable. As such, causal modeling is a potentially important technique in value-added assessment, particularly if one is interested in understanding the process by which student development occurs rather than merely predicting its occurrence. It is frequently the case that, net of other influences, a particular variable may have only a trivial or non-significant direct effect on student development, yet its indirect influence may be substantial and statistically significant. By their very nature traditional regression analyses that focus on prediction will overlook this indirect influence, and lead to conclusions that the variable has an unimportant influence on student development.

Recent causal modeling analyses of the national Cooperative Institutional Research Project samples, for example, have suggested that college experience variables, such as place of residence and the size and complexity of the institution attended, have few if any net direct effects on student outcomes such as educational aspirations, academic self-concept, social self-concept, or humanitarian/civic involvement values. They do, however, have significant indirect effects that are transmitted through their influence on level of student social and extracurricular involvement during college. Similarly, while academic achievement during college did not directly affect the subsequent occupational or economic attainments of individuals, it did have an important indirect effect on them by enhancing educational attainment (Pascarella, 1985b, 1985c; Pascarella, Smart, Ethington and Nettles, 1986; Pascarella, Smart & Stoecker, 1986).

The point to be made here is not that value-added assessment should

be concerned with the particular variables in the above analyses. Rather it is to suggest that the concern of causal modeling with understanding the patterns of direct and indirect influences in a longitudinal process can provide a more complete and accurate estimation of the influence of specific educational experiences on student development. As such it is an important tool for sharpening the focus and increasing the understanding yielded by value-added analyses.

IV. An Example of the Use of Causal Models in Value-Added Assessment

One area where causal modeling might significantly enhance value-added assessment is in estimating the influence of differential coursework and curricular patterns on cognitive development. It seems reasonable to assume that the nature of one's academic program will be a major, if not the major, influence on learning and cognitive development during college. Recent evidence from secondary school samples, for example, suggests that differential quantitative course work accounts for much of the gender difference in Scholastic Aptitude Test mathematics scores (Pallas and Alexander, 1983). Thus, one might hypothesize that differential patterns of course work taken during college will have important direct effects on how much a student learns and in what areas he or she learns it (Pace, 1979).

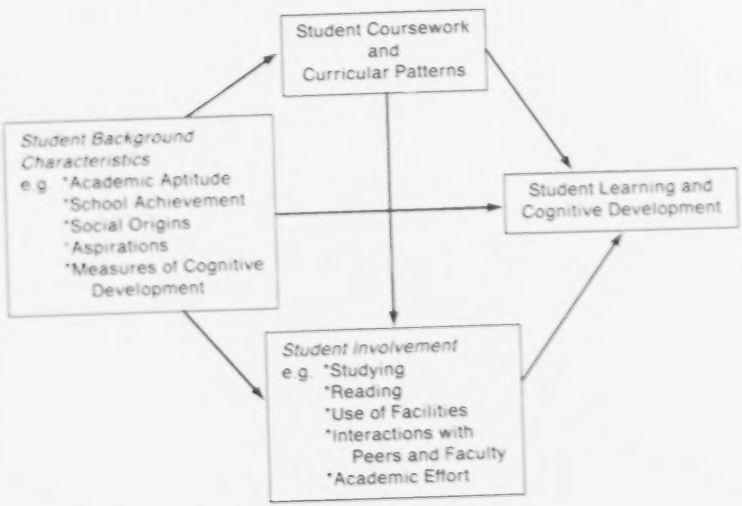
Beyond direct effects on learning, however, one might also be interested in how a student's academic experience indirectly influences cognitive outcomes by influencing the different dimensions of student involvement in college. Astin (1984) defines student involvement as the extent or amount of physical and psychological energy that the student devotes to the academic experience. Involvement includes not only time spent studying and in laboratories, but also time spent interacting with faculty and participation in cultural, artistic and extracurricular activities which enhance the intellectual impact of the institution. Much of the research of Astin (e.g., Astin, 1977, 1982, 1985a) and others (e.g., Pascarella, 1980; Terenzini & Pascarella, 1980; Volkwein, King & Terenzini, 1986) has underscored the importance of student involvement as an influence on cognitive development. Apparently a good deal of what students learn during college is the direct result of their own efforts. These efforts, of course, are no doubt a function of individual student attributes. Net of these attributes, however, they are also likely to be formed, in part at least,

by the nature of the student's academic and coursework experiences. Methods of organizing or quantifying student coursework or course-taking patterns are offered by Blackburn, Armstrong, Conrad, Didham & McKune (1976); Prather, Williams & Wadley (1976); Beeken (1982); McCombs & Smith (1986); and Ratcliff (1986).

Recently Pace (1984) has developed an instrument (The College Student Experiences Questionnaire) that measures the student's level of effort or involvement in various activities (e.g., studying, reading, attending cultural events, interacting with faculty and peers) during college. The CSEQ is essentially a series of scales that estimate the amount, scope and quality of effort students invest in using the salient facilities and opportunities provided by the institution. As such, the CSEQ is a potentially important instrument for assessing Astin's (1984) concept of "involvement."

Employing the CSEQ, one might develop an explanatory model of learning and cognitive development in college which posits that student coursework/curricular patterns are a function of student aptitude and various student background characteristics (e.g., social origins, educa-

Figure 2: A General Causal Model for Assessing the Effects of Student Coursework and Curricular Patterns on Student Learning and Cognitive Development During College



tional and occupational aspirations, gender). In turn, net of aptitude and background characteristics, coursework and curricular patterns would be expected to directly influence extent of student involvement. Finally, measures of learning and cognitive development at the end of college would be seen as a function of entering academic aptitude and student background characteristics, coursework and curricular patterns, and extent of student involvement. Figure 2 is a graphic portrayal of the general causal model.

Estimation of this model would permit determination of the total impact of differential coursework and curricular patterns on measures of student learning and cognitive development at the end of college. One would be able to estimate not only the net direct effects, but also the indirect influence through student involvement. The indirect effects would indicate the extent to which the institution's major structural mechanism for influencing student cognitive development (i.e., the academic program) does so by influencing students' involvement in their own learning. Such evidence might suggest ways of structuring student coursework or curricular patterns to maximize both the direct and indirect effects on learning and cognitive growth.

V. General Versus Conditional Effects

This issue concerns the level at which value-added or net educational effects are assessed. Most existing attempts at value-added assessment at the institutional level have assumed that the impacts of educational experiences are general, that is, that the impact is essentially the same for all students. This assumption certainly has the appeal of parsimony (i.e., other things being equal, the simplest explanation is often the optimal one). It can be argued, however, that assuming only general effects in one's analytic or assessment model ignores individual differences among students attending the same institution or exposed to the same educational experiences to produce conditional rather than general effects. Thus, the magnitude of the influence of certain educational experiences on student development may vary for students with different characteristics (e.g., level of entering aptitude, degree of prior exposure to, or competence in specific course content, level of intellectual orientation). Conditional relationships such as this might well be overlooked in assessment approaches which consider only general effects. In certain situations this may lead one to conclude that effects of specific educational experiences

are trivial, when in fact they may have pronounced positive effects for certain subgroups of students (Pascarella, 1985a).

The notion of conditional effects determined by the interaction of individual differences among students with different methods of teaching or the presentation of course content is a respected tradition in instructional research. Here it is typically referred to as aptitude x treatment interaction (Cronbach & Snow, 1977). Underlying its application in instructional research, however, is the more general perspective, supported by the psychology of individual differences, that not all individuals will benefit equally from the same educational experience. This idea may run somewhat counter to state-initiated mandates for accountability in which institutions are expected to demonstrate certain levels of effectiveness in promoting cognitive and other development for all students. Nevertheless, the consideration of conditional effects might well function to sharpen the focus of value-added assessment at the institutional level and enable it to better identify those particular students who are benefiting most or least from certain educational experiences. This information could then be used to focus institutional efforts on those student constituencies where its efforts appear to be least effective. Applications of the investigation of conditional effects in postsecondary education are shown in the work of Holland (1963) for career choice and academic achievement; Pfeifer (1976) for race and grades; Buenz and Merril (1968), Domino (1968), Pascarella (1978), Ross & Rakow (1981), and Stinard & Dolphin (1981) for different instructional approaches; Pascarella & Terenzini (1979) and Bean (1985), in research on student attrition from college; and Pascarella, Smart, Ethington & Nettles (1986) in research on the development of self-concept during college.

VI. Are Value-Added Analyses Valuable?

My answer to this original question of the paper is a cautious "yes." Undoubtedly, a value-added type approach can make potentially important contributions to our knowledge about institutional impact. My cautions have to do with the term itself and with the need for its rigorous application at the institutional level if we are to provide policy makers with accurate and useful assessments of institutional impact. As I have argued above, value-added is perhaps current and overly pretentious terminology for a long-standing and basic issue in educational research; namely, what are the net effects of educational experiences on student

cognitive and non-cognitive development? It may be to our advantage in the future to remind ourselves of this, for in doing so we can move more directly to substantive conceptual and methodological concerns.

Based on the above definition of the value-added approach, I have argued that a major concern should be on ways in which we can enhance the validity and usefulness of results yielded by value-added assessments. To this end three methodological issues were discussed. First, it was argued that simple average change or improvement on some measure of student development often provides a misleading estimate of the long-term effects of college. Alternative cross-sectional designs combined with statistical controls were suggested as ways to arrive at a more accurate estimate of the net effect of college.

Second, it was suggested that value-added analyses become increasingly useful in terms of policy as they increase their focus on the specific aspects of the collegiate experience which may affect student development. In addition to estimating the net effects of an institution, do they increase our understanding of how that institution functions to influence student development? To this end, causal modeling was suggested as an approach to value-added assessment which: 1) provided a theoretical template for understanding the process by which the effects of college or other educational experiences occur, and 2) permitted one to obtain a more complete estimate of the impact of various college experience measures by estimating both direct and indirect effects on student outcomes.

Third, it was suggested that value-added assessments that consider only the general effects of college disregard the very real possibility that not all students may benefit equally from the same educational experiences. Despite their usefulness in terms of a parsimonious estimate of educational effects, average differences or correlations may conceal as much as they reveal (Feldman & Newcomb, 1969). The more revealing question in terms of both policy and understanding of the complex dynamics of institutional impact is: what kinds of students change in what ways when exposed to what kinds of educational experiences?

Finally, it should be pointed out that the accountability movement and its attendant concern for assessing the student development outcomes of postsecondary education is likely to be with us for some time. Ewell (1986) has suggested that no less than 16 states have, or are currently in the process of developing assessment plans for estimating the outcomes of public postsecondary education. This suggests that a good deal of postsecondary education policy, and perhaps even funding, will be based

on the data we provide. It behooves us as educators and social scientists to maximize the credibility of our assessments of student development by collecting data under the most rigorous conditions possible and analyzing them in ways which increase our understanding the full range of specific institutional impacts.

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